NI 9481E

4-Channel SPST Electromechanical Relay Module

NATIONAL INSTRUMENTS™
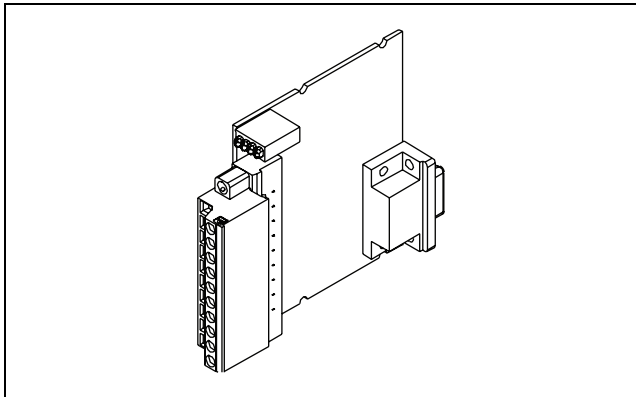
This document describes how to use the National Instruments 9481E and includes dimensions, terminal assignments, and specifications for the NI 9481E. Visit ni.com/info and enter rdsoftwareversion to determine which software you need for the modules you are using. For information about installing, configuring, and programming the system, refer to the system documentation. Visit ni.com/info and enter cseriesdoc for information about C Series documentation.

⚠ **Caution** National Instruments makes no electromagnetic compatibility (EMC) or CE marking compliance claims for the NI 9481E. The end-product supplier is responsible for conformity to any and all compliance requirements.

⚠ **Caution** The NI 9481E must be installed inside a suitable enclosure prior to use. Hazardous voltages may be present.

NI 9481E Dimensions

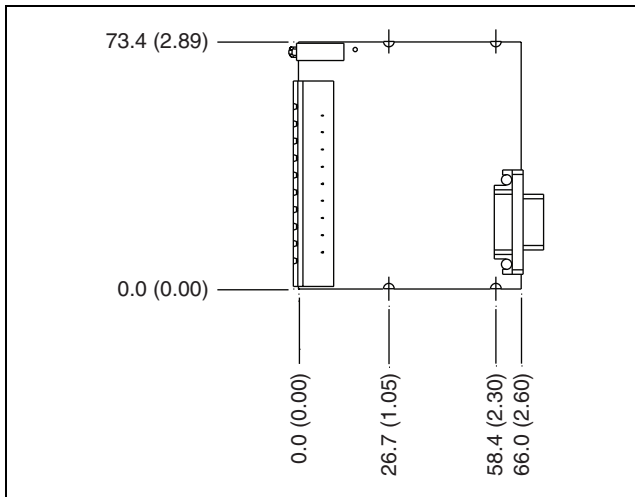The following figure shows the dimensions of the NI 9481E.

Figure 1. NI 9481E Dimensions in Millimeters (Inches)

Connecting the NI 9481E

The NI 9481E has a 10-terminal detachable screw-terminal connector that provides connections for four electromechanical relay channels.
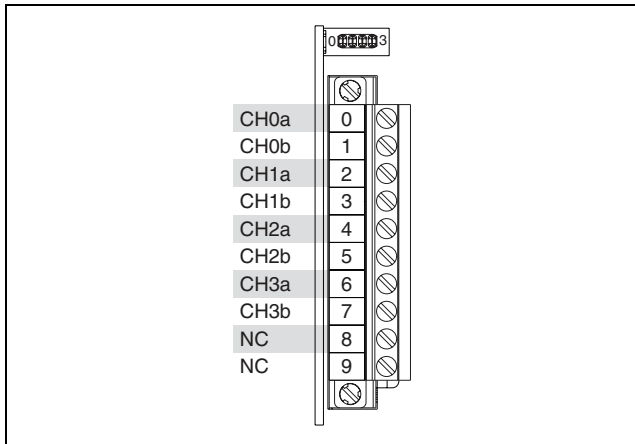

Figure 2. NI 9481E Terminal Assignments

Each electromechanical relay channel has two interchangeable terminals, CHa and CHb.

Each channel has an LED that indicates the state of the channel. When a channel LED is lit, the channel is on. When the LED is dark, the channel is off. The LEDs are disabled when the chassis is in sleep mode. Refer to the *Sleep Mode* section for more information about sleep mode.

When connecting a load to the NI 9481E, connect the positive lead of the load to either the CHa or the CHb terminal, and the ground of the load to one of the leads of the power supply. Connect the remaining CHa or CHb terminal to the other lead of the power supply. Figure 3 shows a possible configuration.
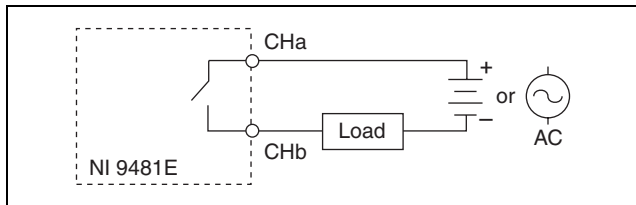

Figure 3. Connecting a Load to the NI 9481E

Note You must use 2-wire ferrules to create a secure connection when connecting more than one wire to a single terminal on the NI 9481E.

When the channel is turned on, the terminal connected to the load drives current or applies voltage to the load. When the channel is off, the terminal does not drive current or apply voltage to the load.

Sleep Mode

This module supports a low-power sleep mode. Support for sleep mode at the system level depends on the chassis that the module is plugged into. Refer to the chassis manual for information about support for sleep mode. If the chassis supports sleep mode, refer to the software help for information about enabling sleep mode. Visit ni.com/info and enter cseriesdoc for information about C Series documentation.

Typically, when a system is in sleep mode, you cannot communicate with the modules. In sleep mode, the system consumes minimal power and may dissipate less heat than it does in normal mode. Refer to the *Specifications* section for more information about power consumption and thermal dissipation.

Specifications

The following specifications are typical for the range –40 to 85 °C unless otherwise noted.

Output Characteristics

Number of channels .... 4 electromechanical relay channels

Relay type .... Single pole single throw (SPST)

Power-on output state .... Channels off

Switching capacity (resistive load)

    Switching voltage .... 60 VDC max, 250 V_{rms} max

    Switching current, per channel

        One channel on .... 4 A max at 30 VDC, 1 A max at 60 VDC, 4 A max at 250 V_{rms}

        All channels on .... 2 A max at 30 VDC, 1 A max at 60 VDC, 2 A max at 250 V_{rms}

Resistance per channel,
channel on .... 50 mΩ

Switching rate .... 1 operation per second

Relay release time .... 5 ms max

Relay operate time .... 10 ms max

Relay bounce time .... 3 ms

Off state leakage .... 10 µA max

Life expectancy

    Mechanical (no load) .... 20,000,000 operations

    Electrical (connecting to load) ... 100,000 operations

MTBF .... 460,321 hours at 25 °C;
Bellcore Issue 2, Method 1,
Case 3, Limited Part Stress
Method

Note Contact NI for Bellcore MTBF specifications at other temperatures or for MIL-HDBK-217F specifications.

Power Requirements

Power consumption from chassis

    Active mode .... 580 mW max

    Sleep mode .... 5 mW max

Thermal dissipation (at 70 °C)

    Active mode .... 1.5 W max

    Sleep mode .... 5 mW max

Physical Characteristics

Use a dry, low-velocity stream of air to clean the module. If needed, use a soft-bristle brush for cleaning around components.

Screw-terminal wiring .... 12 to 24 AWG copper conductor wire with 10 mm (0.39 in.) of insulation stripped from the end

Torque for screw terminals .... 0.5 to 0.6 N · m (4.4 to 5.3 lb · in.)

Weight .... 76 g (2.7 oz)

Safety

Safety Voltages

Connect only voltages that are within the following limits.

CHa-to-CHb.....................................250 V_{rms} max,
Measurement Category II

Measurement Category II is for measurements performed on circuits directly connected to the electrical distribution system. This category refers to local-level electrical distribution, such as that provided by a standard wall outlet, for example, 115 V for U.S. or 230 V for Europe.

⚠️ **Caution** Do *not* connect the NI 9481E to signals or use for measurements within Measurement Categories III or IV.

Isolation

    Channel-to-channel

        Continuous ....250 V_{rms}
        (Basic insulation)

        Withstand ....1,400 V_{rms}, verified by a 5 s dielectric withstand test

Channel-to-earth ground

    Continuous .... 250 V_{rms}
                                   (Double insulation)

    Withstand .... 2,300 V_{rms}, verified by a 5 s
                                   dielectric withstand test

Safety Standards

This product meets the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use when installed in a suitable enclosure:

- IEC 61010-1, EN 61010-1

- UL 61010-1, CSA 61010-1

Note For UL and other safety certifications, refer to the product label or the *Online Product Certification* section.

Online Product Certification

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for this product, visit ni.com/certification, search by module number or product line, and click the appropriate link in the Certification column.

Environmental

National Instruments C Series modules are intended for indoor use only but may be used outdoors if installed in a suitable enclosure. Refer to the manual for the chassis you are using for more information about meeting these specifications.

Operating temperature
(IEC 60068-2-1, IEC 60068-2-2) ..... −40 to 85 °C

Storage temperature
(IEC 60068-2-1, IEC 60068-2-2) ..... −40 to 85 °C

Operating humidity
(IEC 60068-2-56) .... 10 to 90% RH,
                                                                  noncondensing

Storage humidity
(IEC 60068-2-56) .... 5 to 95% RH,
                                                                  noncondensing

Maximum altitude .... 2,000 m

Pollution Degree (IEC 60664) 2

Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at ni.com/environment. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers   At the end of the life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit ni.com/environment/weee.

电子信息产品污染控制管理办法 （中国 RoHS）

中国客户 National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。关于 National Instruments 中国 RoHS 合规性信息，请登录 `ni.com/environment/rohs_china`。(For information about China RoHS compliance, go to `ni.com/environment/rohs_china`.)

Where to Go for Support

The National Instruments Web site is your complete resource for technical support. At `ni.com/support` you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world to help address your support needs. For telephone support in the United States, create your service request at `ni.com/support` and follow the calling instructions or dial 512 795 8248. For

telephone support outside the United States, contact your local branch office:

Australia 1800 300 800, Austria 43 662 457990-0,
Belgium 32 (0) 2 757 0020, Brazil 55 11 3262 3599,
Canada 800 433 3488, China 86 21 5050 9800,
Czech Republic 420 224 235 774, Denmark 45 45 76 26 00,
Finland 358 (0) 9 725 72511, France 01 57 66 24 24,
Germany 49 89 7413130, India 91 80 41190000,
Israel 972 3 6393737, Italy 39 02 413091, Japan 81 3 5472 2970,
Korea 82 02 3451 3400, Lebanon 961 (0) 1 33 28 28,
Malaysia 1800 887710, Mexico 01 800 010 0793,
Netherlands 31 (0) 348 433 466, New Zealand 0800 553 322,
Norway 47 (0) 66 90 76 60, Poland 48 22 3390150,
Portugal 351 210 311 210, Russia 7 495 783 6851,
Singapore 1800 226 5886, Slovenia 386 3 425 42 00,
South Africa 27 0 11 805 8197, Spain 34 91 640 0085,
Sweden 46 (0) 8 587 895 00, Switzerland 41 56 2005151,
Taiwan 886 02 2377 2222, Thailand 662 278 6777,
Turkey 90 212 279 3031, United Kingdom 44 (0) 1635 523545